



October 7, 2013

**Ken Thiessen
Oregon Department of Environmental Quality
Northwest Region
2020 SW 4th Avenue, #400
Portland, Oregon 97201**

RE: Response to DEQ July 19, 2013 Letter, Draft Residual Human Health and Ecological Risk Residual Assessments Willamette Cove Upland Facility

Dear Ken:

This letter was prepared in response to the Oregon Department of Environmental Equality (DEQ) letter from Ken Thiessen to Dwight Leisle, Port of Portland on July 19, 2011 transmitting comments from DEQ on the Residual Risk Assessments (RRAs) for the Willamette Cove Upland Facility. The responses below were prepared by Formation Environmental and Apex Companies LLC on behalf of the Port of Portland. It is our intent that these responses reflect the discussions of individual comments during meetings with DEQ on September 5, 2013 and September 16, 2013.

The original DEQ comments from the July 19 letter are presented below, along with the Port's response. Please don't hesitate to call Dwight Leisle (503.415.6325) or me (303.442.0267) if you have any questions. Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark C. Dunn Lewis". The signature is written in a cursive, flowing style.

Mark C. Dunn Lewis, PhD
Formation Environmental

Ken Thiessen, October 7, 2013

cc:

Mike Poulsen, DEQ NWQ

Jennifer Peterson, DEQ NWQ

Katy Weil, Metro

Dwight Leisle, Port of Portland

Michael Pickering, Apex Companies LLC

**The Port of Portland Responses to Oregon DEQ Comments:
Draft Residual Ecological and Human Health Risk Assessments**

The following provides responses from the Port of Portland (Port) on the comments from Oregon DEQ on the following documents. Both documents were prepared for Apex Companies LLC and the Port of Portland by Formation Environmental, February 2013.

- *Draft Ecological Risk Assessment, Residual Risk Assessment, Willamette Cove Upland Facility.*
- *Draft Residual Human Health Risk Assessment, Willamette Cove Upland Facility.*

DEQ Comments/Port Responses on the Residual Ecological Risk Assessment.

DEQ General Comments to be considered

- 1. DEQ Comment:** *The document is well written and organized and provides an excellent assessment of ecological risks.*

Response: No response required.

- 2. DEQ Comment:** *An uncertainty section is missing from the document and is needed to provide a description and analysis of the key uncertainties and risk analyses.*

Response: Discussion of uncertainties in the draft was embedded with the risk characterization discussion for chemicals and endpoints. A separate uncertainty section will be added that summarizes previous points made in the text.

- 3. DEQ Comment:** *The risk assessment focus is on plants, invertebrates, and small home range birds and mammals. For bioaccumulatives such as PCBs,*

dioxins and furans, and mercury, impacts to upper trophic level receptors should be discussed.

Response: An analysis of risk to wide-ranging wildlife species such as hawks and weasels will be added to the analysis.

General Conclusions to be considered and carried forward into FS as appropriate

- 1. DEQ Comment: Central Parcel:** *Hot spot levels of mercury, copper, and lead across multiple ecological receptors (plants, invertebrates, birds and mammals) are widely distributed in riverbank and upland soil in the Central Parcel. Significant concentrations above risk levels are also present for zinc, antimony, chromium and nickel. Hot spot levels of dioxins and furans occur in the limited upland soil sampled in the Central Parcel. The extent of this risk has not been defined, but based on several lines of evidence dioxins and furans may be present in other upland soil areas. In addition to metals, the Central Parcel's beach area and uplands are elevated in PAHs. Slag is present in this area.*

Response: Please see subsequent comments and responses on Hot Spot identification and the dioxin/furan (D/F) sampling, as the clarifications reached in the meeting with DEQ on September 5, 2013 may influence these statements.

- 2. DEQ Comment: Eastern Parcel:** *Hot spot levels of lead and copper are found beach areas in the Inner Cove adjacent to the Eastern parcel and the beach, riverbank and upland soil adjacent to the railroad embankment. Significant concentrations above risk levels are also present for zinc, chromium, antimony, nickel and high molecular weight PAHs. PCBs are present at hot spot levels in the Eastern Parcel inner cove seep area and are above risk levels in upland and riverbank soil. However, the upland soil (adjacent to the Central Parcel) and the Inner Cove Seep appear to be from two different sources based on location and Aroclor composition. The extent of PCBs above risk levels in seep, riverbank soil and upland soil has not been fully characterized and the extent of risk levels has not been defined.*

Response: The Eastern Parcel and the Inner Cove were evaluated as separate Exposure Units, at the request of DEQ. DEQ has stated that “the extent of PCBs above risk levels in seep, riverbank soil and upland soil has not been fully characterized” is unclear. The following is intended to clarify this statement.

Seep. The Port is unaware of any seeps at Willamette Cove. A petroleum sheen was observed at the inner cove beach area during implementation of the remedial action at the McCormick & Baxter site in 2004. The test pits and removal action demonstrated that there was no continuing source to the river from the upland area; and appeared to be a localized source area. The excavation was terminated at the edge of the water, so residual product may have remained beneath the Oregon Division of State Lands (DSL) property located riverward of the OLLW.

Trenching was completed to assess the potential connection between the Facility and the inner cove beach area in 2010. No petroleum sheen was observed on groundwater in the trenches. Grab groundwater samples were analyzed for diesel and oil-range TPH, total and dissolved Priority Pollutant 13 Metals, total PCBs, total PAHs, total organochlorine pesticides, and VOCs. Low concentrations of these chemicals were detected (with the exception of pesticides and VOCs). The Inner Cove Beach EU was included in the RERA at DEQ direction, but the VCP agreement does not include this area in the Upland Facility. Rather, the VCP and subsequent agreements between DEQ and the Port indicate that the beach area would be characterized as part of the Portland Harbor Remedial Investigation (RI).

Riverbank. PCBs were detected in the riverbank samples (at concentrations up to 1.85 mg/kg) from the WC-SSH sampling area. Multiple phases of sampling were completed to delineate the nature and extent.

Upland. PCBs were non-detect in all of the upland samples from the Eastern Parcel. Following is a list of those samples.

- Deep samples from borings SE/E-1-10, SE/E-2-10, SE/E-3-10, SE/E-4-20, SE/E-5-10, and SE/E-6-20
- Hand auger samples from HA-1 through HA-4

- Shallow soil samples from borings TP-37/S-1, TP-38/S-2, and TP-39/S-2
- TB-3-SC1
- A3C1

DEQ states that “the upland soil (adjacent to the Central Parcel) and the Inner Cove Seep appear to be from two different sources based on location and Aroclor composition”. PCBs were (1) non-detect in upland soil from the Eastern Parcel and (2) detected at significantly lower concentrations in upland soil from the Central Parcel (relative to the Eastern Parcel beach). This supports the conclusion that the upland is not a source of the PCBs detected in the deep beach soil.

3. DEQ Comment: *Western Parcel:* *Characterization on the Western Parcel is limited –only 5 samples for most analytes are available from the upland railroad area. No samples were taken to characterize riverbank soil. This area exceeds risk levels for HPAHs.*

Response: Comment noted; however, the sampling was consistent with work plans. For all parcels on the site, RI sampling was proposed by the Port and Metro, and approved by DEQ. Most of the sampling to date has been focused on areas of concern in the Upland Facility (UF) that were locations of particular contamination concern because of specific activities. Therefore, sampling across the UF is biased toward areas of higher concentration and exposure estimates. In addition, riverbank sampling was conducted as directed by DEQ based on the guidance identified for Source Control Program.

The Source Control Evaluation (SCE) concluded that the West Parcel has low potential for erosion. Although the riverbank is relatively steep and the shoreline is subject to relatively high bed shear during high-flow conditions, the riverbank is heavily armored and covered with thick vegetation. Furthermore, the riverbank location has been unchanged since it was constructed more than 30 years ago. Because there is no current or reasonably likely complete contaminant pathway to the river via soil erosion, the West Parcel is an excluded site (as defined by JSCS, a site that does not require source control) for the riverbank erosion pathway.

Specific Comments:

1. DEQ Comment: Table 2-1, Ecological Level II Screening Level Values:

a. Document updates required:

PCBs: The value provided for total PCBs should be applied to each Aroclor. Since there appear to be two sources, Aroclor 1260 and 1254 should be distinguished. The SLV for birds should be listed as 0.371 mg/kg and mammals 0.655 mg/kg. These are LOAEL based SLVs and therefore should not be multiplied by 5 (or Q of 5). This will change the results for screening soils for birds and mammals for the East Parcel Upland, (Appendix D) as well as the hot spot levels. Additionally, Figure 2-9 should be revised.

Response: DEQ directed the use of the SLVs in a teleconference and unofficial letter with comments on the BERA, citing Oak Ridge National Laboratory documents and the Washington MTCA cleanup levels. The Port incorporated the values as directed by DEQ (See Table 2-1 in the RERA).

Based on discussion on September 5, 2013, the Port agrees to apply the SLVs named above to total PCBs concentrations and to each of the Aroclors for which data are reported for Willamette Cove. The RERA Table 2-1 shows both the 0.65 and 0.371 values for mammals (corresponding to both the MTCA and ORNL values), and 0.655 for birds. The revised document will show the SLV for mammals as 0.371 mg/kg, and 0.65 mg/kg for birds. These SLVs will be shown for each of the Aroclors and for total PCBs.

The Port wishes to note, however, that these values are inconsistent with the Level II SLVs published by ODEQ in Table 1 of ODEQ Level II Screening Level Values (ODEQ 2001). In addition, the Washington MTCA regulations (Table 749-3) show only values for Plants (40 ppm) and 'wildlife' at 0.65 ppm. The ORNL ecorisk PRG documents (Efroymson et al., 1997; Table 6) show 0.371 ppm for shrews and 0.655 ppm for American Woodcock. Both the MTCA and ORNL tables identify these values for application to PCBs, which we interpret to mean total PCBs.

Reference Cited:

R. A. Efroymson, G. W. Suter II, B. E. Sample, D. S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. ES/ER/TM-162/R2

b. Document updates required:

*Dioxin TEQ: Bird and mammal SLVs should be presented using congener-specific risk-based concentrations. DEQ calculated congener specific RBCs using intake equations from EPA Eco SSLs (2007) and prey uptake model from Jager, (1998) [$\log K_{ww} = 0.87 * \log K_{ow} - 2.0$] and TRVs for shrew $1.00E-05$ mg/kg/day and robin $1.40E-04$ mg/kg/day. Dioxins and furan congeners should be compared to the following tabulated RBCs calculated by DEQ, presented in Table 1 for mammals and Table 2 for birds. Where available, PCB congener RBCs should be calculated and should be incorporated in the dioxin/ furan TEQ evaluation. Dioxin total toxicity equivalency (TEQ) toxicity quotients for each sampling location using LOAEL risk based concentrations for chlorinated PCDD and PCDF congeners are presented in DEQ Table 3. Total TEQ toxicity quotients > 1 indicate unacceptable risk and $TQ > 10$ indicate hot spot levels.*

Response: Based on the discussion with DEQ on September 5, 2013, the Port will use the RBCs provided by DEQ in the Level II screen. The Port will also expand the more detailed exposure and risk analysis for dioxins so that risk is calculated for each detected congener, as converted to the TEQ to 2,3,7,8 TCDD. Total dioxin risk will then be calculated based on the sum of the risk from individual congeners. As discussed, congener-specific Kow values from the EPA Estimation Program Interface (EPI) Suite will be used where dioxin uptake estimating is necessary, such as in expanded exposure analysis.

In the initial draft, dioxins were included in the expanded Level II analysis using total TEQ based on the sum of concentrations from individual congeners. See section 4.2.6 and 4.3.6 in the RERA. This is a more common approach where screening level results are needed.

c. Comment to be considered with potential document update required:

Mercury: The DEQ Level II SLV for direct exposure is 0.025 mg/kg (bird s) and 4 mg/kg (mammals) considering the presence of methylmercury. The potential for the presence of methyl mercury should be evaluated in the document.

Response: The potential for methyl mercury in soils will be evaluated in the revised document. The potential presence of methyl mercury in surface soils seems low since the reducing conditions that promote methylation would not generally be present in surface soils. Note that mercury was retained as a COPC for all receptors except mammals in the Central Parcel, so incorporating this change into the Level II screen may not change results of the COPC identification.

2. DEQ Comment: Document updates required: Table 4-14, Hot Spot Values for Ecological Receptors: *Hot spot levels are 10 times the acceptable risk level. If a NOAEL SLV is used, a 5 times factor can be used to estimate the LOAEL. However, where LOAEL SLVs were estimated directly, only a factor of 10 should be applied to LOAEL SLVs. This will change hot spot levels presented in Table 4-14.*

Response: The hot spot values shown in Table 4-14 were based on the Level II SLVs published by DEQ (2001), and the 5x multiplier was applied properly based on DEQ Hot Spot guidance (1998). Except for PCBs, these hot spot values will remain unchanged, based on the discussion with DEQ on September 5, 2013. The SLVs for Aroclors for birds and mammals will be replaced by the values cited in Comment 1a, and multiplied by a factor of 10 to reflect that the SLVs are intended to be LOAEL-based. However, we note that the PCB values cited are not published SLVs, nor do they specifically correspond to Acceptable Risk Levels based on Oregon rules. Neither Oregon rules nor guidance are specific for using LOAEL-based screening levels in generic hot spot calculations.

3. DEQ Comment: Document updates required:

Section 2.2, Observed Impacts: The presence of sheen, oil, and slag is not discussed in the risk assessment, although it is documented in the Phase I Progress Report, 2001 and the Source Control Report. This information should be provided in this section of the risk assessment.

Response: The sheen and slag presence will be described in the document. But note that the sheen was technically not in the Willamette Cove Upland unit, but rather in the river. In addition, the sheen was observed over 10 years ago and has not been observed since.

4. DEQ Comment: Document updates required:

Section 2.5.4, Calculating COI Concentrations: The text appropriately identifies several riverbank concentrations as composites, but does not discuss that there are test pit data that are also composite samples. Test pit composite data should be included in the dataset (Appendix B) and should be included in the composite risk analysis.

Response: The test pit composites are samples that were combined from at least two test pit locations. In many of the composites, subsamples were taken from outside of the established depth intervals. In most cases, the test pits are represented in the discrete data from known depth intervals. Some of the test pit composites contained subsamples from different Exposure Units, and at least one includes a subsample (TP9) that was in the Lead Removal Action Area. As agreed in a September 5, 2013 meeting with DEQ, the Port will provide information that shows details of the makeup of the composite samples, and will show UCL90 values calculated with the test pit composites. Additionally, the uncertainty associated with excluding test pit composites in the dataset will be discussed further in the uncertainty section of the document. For example, the test pit concentrations for COCs will be compared to data from the range of discrete samples and the potential impacts on conclusions will be discussed.

5. DEQ Comment: Document updates required:

Section 3.3.1, Exposure Estimation Model, Lead Assimilation Efficiency:
A range of lead bioavailability can be evaluated in the uncertainty section of the risk assessment. 100% should be used in the risk analysis and main text since the form of lead at the site has not been identified. See also Table 3-1 and Table 3-3 use of 50% bioavailability for the robin and shrew.

Response: Lead bioavailability of less than 100% is only used for soils; lead from ingested food is assumed to be 100%. Bioavailability less than 100% from soils and sediments (and foods) is well documented and could be an important factor in site management decisions in an FS. As agreed in the September 5, 2013 meeting with DEQ, analyses assuming 100% bioavailability from soils will be included in the primary risk evaluation; lower estimates of lead bioavailability will be incorporated as part of the uncertainty analysis.

6. DEQ Comment: Comment to be considered:

Section 3.3.2, Ecological Response Analysis: *DEQ's definition of acceptable risk for populations of ecological receptors is defined in two parts:*

- a. *A 10 percent chance, or less, that more than 20 percent of the total local population will be exposed to an exposure point value greater than the ecological benchmark value (LD50) for each contaminant of concern*
- b. *No other observed significant adverse effects on the health or viability of the local population. This evaluation must evaluate effects on reproduction related to fecundity and the sustainability of the local population.*

By evaluating probability of exposure to "no observed" and "lowest observed" effect levels on mortality, growth, and reproduction the two criteria were met.

Response: No response required.

7. DEQ Comment: Comment to be considered:

Section 4.0, Exposure Analysis, Probabilistic Risk Assessment, Local Population, Number of Animals: *The number of animals (49 shrew and 49 robin) used in the probability of exposure analysis is overestimated in some cases, which when corrected will increase the probability of exposure slightly. The population assessed should be the local population as defined by the size of the facility parcels. The number of organisms in the local population should be based on the number of expected animals within this area. This number should then be rounded down a number divisible by 5 in order to avoid unrealistically high calculated values of b as an artifact of the calculation method given y must be an integer. More information on this issue can be provided in an example upon request. Robin and shrew updates are provided below:*

- a. West Parcel: 5 acres (2 hectares), 10 robin / hectare and 7 shrew
1 hectare shrew (means, EPA Exposure Factors Handbook) = 20
robin; 10 shrew
- b. Central Parcel: 11 acres (4.5 hectares) = 45 robin; 30 shrew
- c. East Parcel: 16 acres (6.5 hectares) = 65 robin; 45 shrew

Response: As agreed on September 5, 2013, the suggested population sizes will be used. However, we note that the calculation of the population size reported in the RERA was consistent with the guidance provided by DEQ for conducting probabilistic analysis for ecological risk assessments. See DEQ Level III ERA guidance, Appendix A.

8. DEQ Comment: Document updates required:

Section 4.3.5, Dioxin /Furan Upland Soil Samples: *Composite Samples DU-1, DU-2, DU-3 and WC-1/2/3 as well as discrete samples WC-1, WC-2 and WC-3 should be included in the Central Parcel Upland Exposure unit in the absence of more spatially representative data. Dioxin I furan TEQ's for birds and mammals should be screened as a part of these units. The results for birds and mammals in Table 3 show dioxin TEQ at hot spot levels in the*

Central Parcel Uplands for all discrete and composite samples (including the multi-incremental samples or MIS). DU-2, which is the westernmost sample, had the highest hazard quotient for the MIS samples.

Response: The direction in the comment is inconsistent with the agreements between the Port and DEQ prior to preparation of the RERA. The agreements specifically identified the MIS-based samples (DU-1, DU-2, and DU-3) as the basis for exposure point calculation for the Wharf Road EU. DEQ specifically identified the average (we used the maximum) concentration among the DU samples as adequate for the EPC for birds and mammals in the Wharf Road EU, whereas individual DU samples should be used for invertebrates and plants (see the December 20, 2011 DEQ comment letter.) The DU samples were collected as MIS samples specifically to support risk-assessment. Because the DU samples were 30-pt composites sampled along a grid, they are not comparable to the “WC” samples cited in the comment, and should not be combined for an exposure assessment. This may be especially true for a RERA, where the focus is on site risk management decisions, and not screening-level analyses to determine COCs.

The comment is also inconsistent with agreements for the RERA based on the approach that the exposure units would be mutually exclusive. (See the March 12, 2012 DEQ comment letter.)

We understand that the analysis requested in the comment will provide additional information on the contribution of D/F congeners to overall risk. However, including the analysis as requested is unlikely to change the overall conclusions of the RERA regarding identification of COCs on which the FS should focus, and is unlikely to contribute to development of remediation alternatives for the FS. The uncertainty associated with excluding the “WC” samples will be discussed in the uncertainty section of the document.

9. DEQ Comment: Comment to be considered:

Section 5.0, Conclusions and Recommendations: *Elevated concentrations of metals in the shoreline areas are representative of upland conditions. The future likely use of the site is as a natural area and therefore plants and invertebrates should be considered in the context of receptors at other*

trophic levels. Table 4 below, prepared by DEQ, presents a summary of contaminants of concern for Willamette Cove exposure areas and appropriate ecological receptor (e.g. plants, invertebrates, birds and mammals). Risk at multiple levels of biological organization increases the weight of evidence of ecological risk. Also note for each exposure area the number of exceedances for each ecological receptor.

Response: The Conclusions section will be expanded to discuss these issues and concepts.

10. DEQ Comment: Document updates required:

Section 4.0 to 5.0, Uncertainty Section: *An uncertainty section should be added here that describes important uncertainties in the dataset and identifies CPECs based on inadequate detection limits or no available SLVs.*

Response: An uncertainty section will be added to the document, and address the major points already addressed in the document and the additional points requested by DEQ in these comments.

11. DEQ Comment: Comment to be considered:

General, Tables and Figures: *Dioxin is misspelled (as dioxan) in several figures and tables.*

Response: The spelling will be corrected.

12. DEQ Comment: Document updates required:

Tables 2-2 through Table 2-7, CPEC Summary by Exposure Unit:

- a. *COIs without screening level values should be included as CPECs on this basis in the summary tables*
- b. *Visual observations of oil, sheen and slag should be included here*

- c. *All TPH data is not included in summary or screening tables (e.g. West Parcel@ 1,810 mg/kg)*
- d. *Aroclors should be listed separately and then added to a "Total PCB" concentration for screening.*
- e. *Discrete and composite results for dioxins and furan TEQ should be presented.*

Response: Edits will be made in the revised report.

13. DEQ Comment: Document updates required:

Table 3-1 and Table 3-3, Uptake Equations:

- a. *Dioxins and furans: Uptake equations should be congener-specific using BAFs presented below ($\log K_{ow} = 0.87 * \log K_{ow} - 2.0$).*
- b. *The use of 50% invertebrates for the shrew is not a realistic assumption. An evaluation that presents the range from 80% to 100% is reasonable.*

Response: See response to Comment #8 regarding the congener-specific D/F uptake. The 50% level was added to represent omnivorous small mammals, not an alternative diet for the shrew. The shrew diet remains the limiting exposure scenario for most of the COCs.

14. DEQ Comment: Document updates required:

Table 3-2, Ecological Benchmark Values, Birds:

- a. Cadmium: *The LOAEL EBV for birds should be 6.4 mg/kg bw-day geomean (EPA Eco SSL, 2005). This will change the results for cadmium LOAEL exceedance for birds for the central beach exposure unit.*
- b. Copper: *The NOAEL EBV for birds should be 4.05 mg/kg bw-day and the LOAEL should be 12.1 mg/kg bw-day for the same study (EPA Eco SSL, 2005). This will not change the results but will change the toxicity quotient in Table 4-3 and 4-4.*
- c. Vanadium: *The EBV for birds should be a NOAEL of 0.344mg/kg bw-day and a LOAEL of 0.688 from the same study (EPA Eco SSL, 2005).*

Response: The above EBV changes will be incorporated into the revised analysis as requested.

15. DEQ Comment: Document updates required:

Table 3-4, Ecological Benchmark Values, Mammals:

- a. Cadmium: *The EBV for mammals should be a NOAEL of 0.77 mg/kg bw-day and a LOAEL of 7.7 mg/kg bw-day from the same study (EPA Eco SSL, 2005). This will change the results slightly in Table 4-12 – LOAEL exposure for the omnivore will exceed a toxicity quotient of 1.*
- b. Copper: *The EBV for mammals should be a NOAEL of 5.6 mg/kg bw-day and a LOAEL of 9.34 mg/kg bw-day from the same study (EPA Eco SSL, 2005). This will not change the results, but it will change the toxicity quotients presented in Table 4-3, 4-9, 4-10 and 4-11.*
- c. Lead: *The EPVs are correct, but the citation should read EPA Eco SSL, 2005.*

Response: The above EBV changes will be incorporated into the revised analysis as requested.

16. DEQ Comment: Document updates required:

Table 4-7 and 4-13, Exposure Calculation for Dioxin / Furan TEQ: *Toxicity quotients should be calculated using information in comment #4 regarding Table 2-1. This will increase the toxicity quotients – see Table 2 on toxicity quotients for each sample using congener specific RBCs.*

Response: We assume the comment above refers to Comment #1 (instead of Comment #4) referring to treatment of different Aroclors in the PCB screening. Please see response to Comment #8 regarding D/F calculations.

17. DEQ Comment: Document updates required:

Table 4-10, Exposure Calculation and Comparison to EBVs: *Aroclors are presented, but Total PCBs should be indicated along with the dominant congeners-1260 and 1248.*

Response: The table (including the footnotes) and text will be changed to clarify that the Aroclors refer to total PCBs as reflected by total Aroclors. As directed in the September 5, 2013 meeting with DEQ, the risk from each Aroclor will be presented.

18. DEQ Comment: Document updates required:

Table 4-14, Generic High Concentration Hot Spot Values for Ecological Receptors:

- a. Plant and Invertebrate Hot Spot Level s: *These should only be multiplied by 10 – the 5 x factor does not apply.*

Response: As agreed in the September 5, 2013 meeting, the 50x multiplier will only be applied where the TRV used to calculate an SLV represents an NOAEL endpoint. Based on the September 16, 2013 meeting, where the plant and invertebrate screening level values from DEQ's Level II SLV Table are not based on NOAEL values, SLVs will be multiplied by the 10x for high hot spot concentrations.

- b. Aroclors and Total PCBs: *The SLVs are 0.371 mg/kg for the shrew and 0.655 mg/kg for the robin (Preliminary Remediation Goals for Ecological End points, 1997). These are LOAEL based SLVs and should be multiplied by 10 to determine hot spot levels.*
- i. *Birds: 3.71 mg/kg*
 - ii. *Mammals: 6.55 mg/kg*

Response: As directed in the September 5, 2013 meeting the bird and mammals SLVs for PCBs that were identified by DEQ are based on LOAELs and therefore will be multiplied by only 10x to calculate High Concentration Hot Spots. , a

- c. Dioxin TEQ: *A toxicity quotient of 10 and above for dioxin TEQ indicate hot spot levels. RBCs presented above are LOAEL SLVs.*

Response: Please see previous Comment #1 on published Level II SLVs, and the use of hot-spot calculations in the response to part “a” of this comment.

19. DEQ Comment: Document updates required:

Table 4-15 and Appendix F, Probabilistic Hot Spots: *Hot spots are location specific and are identified as concentrations that exceed risk-based concentrations. Risk based concentrations cannot be identified from the probability of exposure analysis. Instead, LOAEL risk based concentrations using the intake and EPVs presented in Tables 3-1 through 3-4 in soil should be used to identify hot spots. PCBs and bird and mammalian TEQ should be added to this table.*

Response: As agreed in the September 5, 2013 meeting, the probabilistic hot spots will be removed from the document.

20. DEQ Comment: Document updates required:

Figure 2-1, Habitat Areas: *The map shows the upland facility boundary, but does not state what elevation it is based on. It appears the upland boundary is defined as down to the low water line. The upland facility should be clearly defined in both Figure 2-1 and 2-2.*

Response: The upland facility and elevations lines will be clearly shown in the revised document.

21. DEQ Comment: Document updates required:

Figure 2-2, Conceptual Site Model of Ecological Exposure Pathways:

- a. Soil: *Soil should be defined as riverbank and upland soil down to mean high water.*

Response: Soils will be defined this way in the revised document.

- b. Uptake by Biota and Soil (ingestion, direct contact): *This should show a complete pathway to the aquatic environment with a statement that the in-water Portland Harbor Risk Assessment and the DEQ source control evaluation will be used to evaluate these pathways.*

Response: This note will be added to the figure.

- c. Sediment Exposure (Pore water, Beach Sediment): *The footnote here states "there is no exposure to surface water, groundwater, or to sediment on the Upland Facility". However, Figure 2-1 clearly defines the upland facility boundary down to low water where these exposures occur. Please clarify.*

Response: The Upland Facility as defined by the VCP agreement extends to the mean high water mark. The note is based on the division between the UF and the beach areas that were included in the RERA by direction of DEQ. The figure will be clarified to reflect inclusion of the beach exposure units.

- d. Groundwater: *Exposure to seep areas should be considered complete for terrestrial receptors. Aquatic exposure is also complete and should be footnoted to indicate this will be addressed as a part of the source control and in-water risk assessments.*

Response: The Port agrees that seeps can be exposure points for terrestrial species. However, there are no seeps at the Willamette Cove site.

22. DEQ Comment: Document updates required:

Attachment E, Level III Probabilistic Analysis for Birds and Mammals, Lead, Central Parcel: A removal action conducted in the eastern end of the central parcel in 2008 removed significantly elevated concentrations of metals. The replacement of

these samples with representative samples after the removal is appropriate, but including all of the many samples is out of proportion to the sampling frequency in the remainder of the exposure unit, and biases the distribution low. This is especially the case for lead, where 18 samples from the same 9 locations are included for the 1.0 ft and 1.5 ft depths. All other metals (arsenic, chromium, copper, mercury and zinc) were only analyzed at the 1.0 ft sampling interval representing a total of 9 samples. However, since the leave surface was not re-characterized after removal it is unclear if these samples are representative of the 0-3 ft. soil interval. Recommend presenting the results with and without this area and discuss in the uncertainty section.

Response: The data set for the Central Parcel included samples reported in the Removal Action Report for the area from which soil was removed. However, in some cases data from more than one sampling depth was included for an individual sampling location. This inclusion was an error due to a database query, and will be corrected for the revised document. As discussed in the September 5, 2013 and September 16, 2013 meetings with DEQ, the uncertainty associated with incorporating the removal action area samples will be evaluated in the uncertainty section of the revised report. Specifically, the bias that these samples introduce to the analysis will be evaluated by also running the analysis with a reduced data set.

Oregon Department of Environmental Quality (DEQ) comments on draft: *Residual Human Health Risk Assessment, Willamette Cove Upland Facility*, Prepared for Apex Companies LLC and the Port of Portland by Formation Environmental, February 2013.

General Comments:

- 1. DEQ Comment:** *Document updates required: Site characterization and uncertainty. At our meeting on October 3, 2012, we discussed the lack of identified extent of soil contaminated with unacceptable concentrations of dioxin and PCBs. In moving forward with the risk assessment, we understood that the Port would provide support for why the contaminated areas are expected to be limited. The risk assessment does not support the contention that the contamination is limited. The lack of full characterization of the extent of dioxin and PCB contamination is not discussed in the uncertainty section. Without adequate delineation, the risk assessment will need to include assumptions about the extent of unacceptable concentrations in soil and potential hot spots.*

Response: The revised RHHRA will include an expanded description of the uncertainties associated with the spatial extent of dioxin and PCB sampling. Please see response to specific comment # 6 and #7.

- 2. DEQ Comment:** *Document updates required: TPH. The presence of petroleum hydrocarbons needs to be addressed in more detail. Total petroleum hydrocarbons (TPH) was screened in, but was not quantitatively evaluated in the risk assessment. DEQ developed risk-based decision making guidance in 2003 for quantitatively evaluating risk from petroleum hydrocarbons. Quantitative assessments of TPH risk should be made following this guidance, as presented in DEQ's 2010 human health risk assessment guidance. In addition, sheen has been observed at the site. Following DEQ guidance, the risk assessment should state that the presence of TPH product is considered an unacceptable risk to humans from direct exposure.*

Response: TPH will be quantitatively evaluated in the risk assessment in accordance with DEQ's 2010 human health risk assessment guidance. DEQ's RBCs from Table 5 will be used to calculate risk from TPH exposure throughout the site. Additionally, the presence of TPH product sheen will be addressed and acknowledge as an unacceptable risk to humans from direct exposure in the risk assessment.

Specific Comments:

- 1. DEQ Comment: Document updates required: Page 2-8, Section 2.6.1, third paragraph.** *Chemicals that do not have SLVs should not be eliminated from the risk assessment. As stated in the next sentence, not being able to quantitatively evaluate these chemicals is a source of uncertainty. This should be discussed in the uncertainty section.*

Response: Chemicals that do not have SLVs are a source of uncertainty and will be discussed further in the uncertainty section.

- 2. DEQ Comment: Document updates may be required: Page 2-9, Section 2.6.2, top paragraph.** *Urban residential RBC levels were used to screen recreational exposure. The quantitative information regarding recreational exposure parameter values used in the risk assessment should be used to support the assumption that urban residential RBCs are sufficiently protective as screening values. We calculated trespasser and recreational RBCs using site-specific exposure values, and concur that default urban residential RBCs are protective of the other receptors.*

Response: The text in the document will be updated to clarify that the urban residential RBC levels are sufficiently protective as screening values for all receptors.

- 3. DEQ Comment: Document updates may be required: Page 2-9, Section 2.6.2.** *The text states that EPA RSLs were used for screening if*

no DEQ RBC was available. This approach is consistent with DEQ guidance. However, Appendix D shows that RSLs were not used to screen site concentrations. The lack of a full screen using RSLs does not appear to substantially affect the results of the residual human health risk assessment (RHHRA).

Response: As discussed in the September 5, 2013 meeting, Appendix D uses the EPA RSLs when the DEQ RBC values were unavailable. See the column header titled "Selected SLV (mg/kg) Urban Resident (DEQ)/ Resident (RSL) in Appendix D tables. Also refer to Table 2-1 for the selected screening level values for every COI at WC.

- 4. DEQ Comment: Document updates required (Table 5 to be added and carried forward into FS: Page 2-10, Section 2.6.4, top paragraph.** *The statement that "risk is not generally quantified for complex mixtures like diesel" is contradicted by the use of quantitative risk-based screening levels. It is correct that there is not an RfD for diesel that can be used in risk calculations. However, in 2003, DEQ developed a method for quantifying risks from TPH exposure, and established risk-based concentrations for TPH. DEQ risk assessment guidance allows the use of the RBCs (including TPH diesel RBCs) to calculate risk. Given the high concentrations of diesel in some portions of the site, it is important to quantify the associated risk. DEQ prepared a table of TPH RBCs (attached Table 5). The Port should confirm these calculations and use the RBCs in the risk assessment to identify areas of unacceptable risk and potential hot spots.*

The presence of percent levels of TPH in soil samples in the inner cove area, and the observations of sheen in many soil samples from the West and Central parcels, indicates that separate phase petroleum hydrocarbons are present at the site. RBCs for pathways that include direct contact are not appropriate (or contact with petroleum product. The risk assessment needs to include an acknowledgement that contact with sheen or product in the soil is considered unacceptable. Methods for limiting contact with sheen or product need to be evaluated in the feasibility study.

Response: The TPH RBCs in Table 5 prepared by DEQ will be confirmed and added to the risk assessment. TPH RBCs will be used to calculate risk from TPH exposure throughout the site.

The higher relative concentrations of TPH in the inner cove area are further discussed in the draft *Ecological Risk Assessment, Residual Risk Assessment* General Conclusions DEQ Comment #2 for the Eastern Parcel.

The observations of sheen on soil samples from the West and Central Parcels were noted as part of the field screening procedure. Sheen testing on soil provides a relative indication of whether heavier hydrocarbons are present (however, sheens can be produced from both petroleum products and organic processes). This is not an indication of separate phase hydrocarbons.

5. DEQ Comment: Comment to be considered: Page 5-3, Section 5.2.3, last paragraph. *For pathways with a hazard index greater than 1.0, it is acceptable to evaluate non-cancer risk by toxic endpoint. This can be complicated, however, because most chemicals have more than one toxic endpoint, and the RfD may be based on only one endpoint. DEQ allows but does not require the evaluation by toxic endpoint.*

Response: Comment acknowledged.

6. DEQ Comment: Document updates required: Page 5-9, Section 5.6.1, last sentence. *The Wharf Road EU may represent a small portion of the site; however, the extent of unacceptable dioxin contamination has not been delineated. Given the association of dioxin contamination with widespread metal contamination, and the extensive scale of industrial operations in the central parcel, it is likely that unacceptable dioxin soil concentrations are present over an area larger than the Wharf Road EU. This considerable uncertainty regarding risk needs to be addressed in the uncertainty section.*

Response: The uncertainty associated with dioxin soil concentrations in the Wharf Road Exposure Unit as well as the potential for contamination in the Central Parcel will be addressed in the uncertainty section.

- 7. DEQ Comment: Document updates required: Page 5-10, Section 5.8.** *There is considerable uncertainty in the characterization of contamination at the site that needs to be addressed. Unacceptable dioxin concentrations in soil at the Wharf Road have not been bounded. Because dioxin is more likely associated with central parcel activities rather than some unexplained association with the road, we strongly suspect that additional areas of the central parcel are contaminated with dioxins. This possibility must be addressed and considered in the feasibility study.*

Similarly, the high PCB concentrations in the inner cove beach unit have not been fully delineated or explained. It is possible that PCB contamination is more widespread than currently identified. This uncertainty needs to be acknowledged in the residual risk assessment and addressed in the feasibility study for DEQ. This information may also influence the scope of the EPA in-water remedy at Willamette Cove.

Response: The uncertainties associated with the characterization of dioxin and PCB contamination at the site will be addressed in the HHRRA. These concerns will also be acknowledged and addressed in the feasibility study.

- 8. DEQ Comment: Comment to be noted: Table 3-1.** *As addressed in the Port's follow-up to our June 21, 2013 call, the exposure frequency of 208 days/year applies to all routes (ingestion, dermal and inhalation).*

Response: The exposure frequency of 208 days/year will be applied to all exposure routes (ingestion, dermal and inhalation) for the transient trespasser in Table 3-1.

- 9. DEQ Comment: Document updates required: Table 3-4.** *The ProUCL output for lead shows that the approximate gamma distribution should be used with more than 40 data points. Because there are only 5 samples, the adjusted gamma distribution should be used, resulting in a 90UCL*

of 105 mg/kg; or, alternatively, the maximum value of 95 mg/kg can be used.

Response: The maximum concentration of 95 mg/kg will be used for the EPC for Lead in the West parcel EU.

10.DEQ Comment: Document updates required: Table 3-5. *Mercury is a central parcel COPC missing from this table. The maximum is 20.2 mg/kg, with a 90 UCL of 3.8 mg/kg.*

Response:

As agreed in the September 5, 2013 meeting, Mercury should not be carried through the risk assessment based on the multi-tier concentration-risk evaluation conducted in accordance with DEQ guidance (DEQ 2010). Please see Appendix D-2-1 and D-2-2 for the risk screening summary tables.

11. DEQ Comment: Document updates required: Table 3-7. *Diesel should be a COPC for the inner cove beach, with a maximum concentration of 91,300 mg/kg and a 90UCL of 38,000 mg/kg. These concentrations are more than ten times the urban residential soil RBC of 2,200 mg/kg. Using the TPH RBC of 4,000 mg/kg, the exposure point concentration of 38,000 mg/kg indicates an unacceptable risk with a hazard quotient of 10. TPJ-Id concentrations greater than 40,000 mg/kg indicate potential hot spot locations. This data and associated risk determination must be included in the HHRRA document.*

Response: Diesel will be added as a COPC for the inner cove beach and the associated risk will be addressed in the risk characterization and uncertainty section of the HHRRA report.

12. DEQ Comment: Document updates required: Table 5-8 and Figure 5-1. *Because there is unacceptable risk identified in the exposure*

units, hot spot levels need to be developed for all chemicals of interest, not just chemicals of concern.

Response: As discussed in the September 5, 2013 meeting with DEQ, high concentration Hot Spot values will be calculated for chemicals that exceeded HQ of 1.0 in the Concentration Toxicity Screen. Exceedence of hot spot values will then be mapped for the site.

13. DEQ Comment: Comment to be considered: Table 5-7. *Excess lifetime cancer risks should be presented to one significant digit (e.g., 6×10^4 rather than 6.35×10^4) to avoid implying unwarranted precision. Hazard indices can be presented to two significant digits.*

Response: Excess cancer risks will be presented to one significant digit and the hazard indices will be presented to two significant digits.

14. DEQ Comment: Document updates required: Appendix D.

The column with the heading "Detected chemicals without criteria" includes "?PRG" as an entry. It does not appear that any EPA regional screening levels were used to screen chemicals. Following DEQ guidance, EPA residential RSLs should be used to screen if RBCs are not available. This column can be used to indicate the use of RSLs. Even for chemicals that are not detected, it is useful to compare detection limits with RSLs to see if a definitive screening conclusion can be reached. The lack of a full screen using RSLs does not appear to substantially affect the results of the RHHRA.

Response: Appendix D uses the EPA RSLs when the DEQ RBC values were unavailable. Please see comment #3 for additional information. The footnote for "?PRG" will be updated to clarify that both the DEQ RBCs and EPA residential RSLs were used before this flag was presented.

Appendix D-1-2 is missing.

Response: Appendix D-1-2 was unintentionally excluded from the document and will be added to Appendix D.

***Appendix D-2-1, D-3-1.** For samples that were analyzed for benzo [b+k] fluoranthene instead of the separate compounds, the lower of the RBCs for benzo[b]fluoranthene and benzo[k]fluoranthene should be used.*

Response: The lowest RBC for benzo[b]fluoranthene and benzo[k]fluoranthene was applied to samples analyzed for benzo[b+k]fluoranthene. This seems to meet the goals of the comment.

***Appendix D-2-2.** The note for pentachlorophenol states that there were only two detected discrete values. The table shows that there were no detected concentrations.*

Response: The note will be changed to read “No detected values.”

***Appendix D-3-1.** For evaluation of Total of 4,4'-DDD/DDE/DDT, the RBCs for DDE should be used as a conservative screen. For evaluation of m,p-xylene, the RBC for total xylene should be used.*

Response: The indicated RBCs for 4,4'-DDD/DDE/DDT and m,p-xylene will be used for a conservative screen.

***Appendix D-4-1.** For evaluation of m,p-xylene, the RBC for total xylene should be used.*

Response: The total xylene RBC will be used for m,p-xylene as a conservative screen.

Appendix D-4-2. *There are notations for chemicals with "only 3 detected values". Where screening values (RBCs or RSLs) are available, the maximum concentration should be used to calculate Rij. Cobalt and vanadium are screened in and evaluated, as shown in Table 5-4-2.*

Response: The maximum concentration will be used to calculate Rij and will be screened in the risk assessment.

15. DEQ Comment: Document updates required: Appendix E

- *See comment on Table 3-1.*

Response: The appropriate changes will be made to Table 3-1 as outlined in comment #8.

- *Site-specific PEFs can be used, but the calculations shown in the detailed table should match the values used in the risk assessment.*

Response: Site-specific PEF values will be used in the risk assessment and will be consistent throughout all tables and calculations.

- *Values for IRSadj and SFSadj should be shown explicitly. For example, the IRSadj value for recreational park user in the West Parcel is shown as the ingestion rate (mg/day) of 62.86 for adults and 426.67 for children. Because IRSadj incorporates exposure duration and body weight (as well as toxicity adjustment factors), the units are mg-yr/kg-day. One IRSadj value can be used, combining child and adult exposure (490 mg-yr/kg-day).*

Response: The units for the adjusted ingestion rate will be changed to mg-yr/kg-day to reflect the incorporation of exposure duration, body weight, and toxicity adjustment factors. A single IRSadj value will not be

used as the child and adult exposure are calculated separately for all receptors and exposure pathways in the risk assessment.

- *Similarly, adherence factors (mg/cm^3) should not be modified for early-life exposure. Instead use the SFSadj value of 1445 $\text{mg}\cdot\text{yr}/\text{kg}\cdot\text{day}$ (for combined child and adult exposure).*

Response: The SFSadj value will incorporate the early-life exposure; however, there will be a separate value for the child and adult to be consistent with risk calculations for this assessment.

- *Early-life exposure is included for relevant chemicals in the assessment of cancer risk. It is not appropriate to modify intake rates for non-cancer effects.*

Response: Intake rates will not be modified for non-cancer effects for any chemicals in the risk assessment.